Antimicrobial Resistance

A Recommended Action Plan for British Columbia

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Canadian Cataloguing in Publication Data
British Columbia. Office of the Provincial Health Officer.
Antimicrobial resistance

ISBN 0-7726-4413-6

1. Drug resistance in microorganisms - Government policy - British Columbia. 2. Microorganisms - Effect of antibiotics on. 3. Antibiotics. 4. Anti-infective agents 5. Health planning - British Columbia. I. British Columbia. Antimicrobial Action Plan Steering Committee. II. Title.

QR97.A58B73 2000 616.01'09711 C00-960370-0

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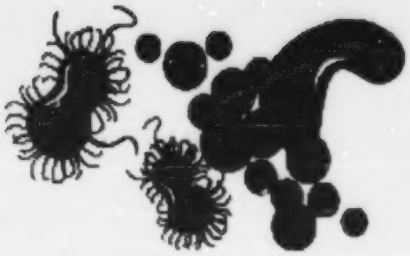

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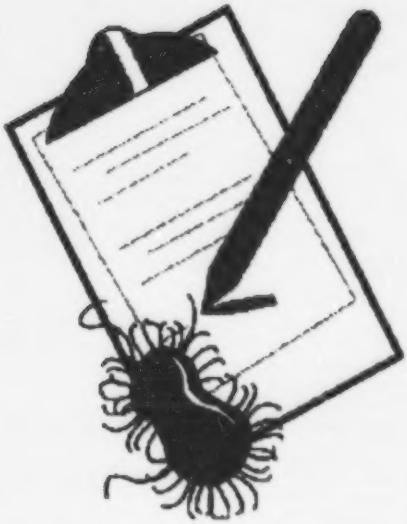

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101-02956/

Antimicrobial Resistance

A Recommended Action Plan for British Columbia

A Report from the Provincial Health Officer

Developed with the assistance of the
Antimicrobial Resistance Action Plan Steering Committee

December 2000

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Acknowledgments

The Provincial Health Officer would like to thank Dodie Katzenstein, a member of the British Columbia Antimicrobial Resistance Action Planning Steering Committee. Dodie Katzenstein facilitated the planning workshop and prepared the first draft of this report under contract to the B.C. Ministry of Health, Office of the Provincial Health Officer.

Graphics on the cover of this report are courtesy of the National Information Program on Antibiotics (http://www.antibiotics-info.org).

Message from the Provincial Health Officer

This report provides a framework for a British Columbia action plan on antimicrobial resistance. The report represents the results of over two years of deliberations by a multi-sectoral provincial steering committee, culminating in a planning workshop conducted in June 2000. Workshop participants included members of the steering committee plus a number of additional content specialists and government representatives (see Appendix II). Thus, the report summarizes input from a broadly-based and interdisciplinary group of experts and stakeholders.

Antimicrobial resistance poses a significant and growing threat to public health in both developed and developing countries. In recent months, several national and international health organizations have issued urgent statements on the issue. Many scientists warn that immediate response is required to prevent the loss of antibiotics as useful weapons against infectious disease. Experts caution that the world now faces an era in which infection – a manageable problem for the past two generations – emerges once again as the leading cause of illness and death among people of all ages.

British Columbia has not yet articulated a comprehensive action plan addressing antimicrobial resistance. Although some control measures have been initiated in the province, current activities are sparse and lacking in coordination.

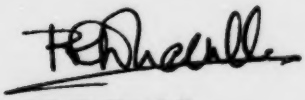
Following a national consensus conference in May 1997, a B.C. Antimicrobial Resistance Action Plan Steering Committee was convened by the Provincial Health Officer to meet the need for development of an effective provincial strategy. Members, who have volunteered their time, represent a range of interests including microbiology, infectious diseases, public health, medicine, veterinary medicine, and the pharmaceutical industry. Chaired by Dr. Shaun Peck, Deputy Provincial Health Officer, the group has worked to determine the scope of the problem in the province and to define priorities for action. The committee has recognized the value of a comprehensive and collaborative provincial approach, both to curtail health risks and to contain escalating costs.

This report offers an assessment of the current status of the problem in British Columbia and priorities for provincial action. It focuses on four key topic areas:

- surveillance;
- case management;
- education and awareness; and,
- animal and agricultural use.

For each topic area, the report identifies the Next Steps – proposed activities that should be implemented in a relatively short time frame and with limited additional resources.

The information that follows is presented in the hope that it will be helpful to providers and consumers of health care. Most importantly, it is hoped that this information will raise awareness and encourage prompt action by those responsible for the development of public policy on this important issue.



P.R.W. Kendall
MBBS, MSc, FRCPC
Provincial Health Officer

Summary of Action Priorities, Evaluation, and Next Steps

Surveillance

Priorities for Action

- Develop a coordinated provincial plan for surveillance of antimicrobial use and antimicrobical resistance, in human and non-human settings.
- Identify and coordinate key source data on antimicrobial resistance and associated morbidity and mortality.
- Define and apply standardized definitions and methods for surveillance data.
- Develop integrated computer systems and database networks.
- Develop platforms for dissemination of information to enable regular publication of surveillance reports.

Evaluation

Indicators for improvements in surveillance include:

- Standardization of practices for screening and lab detection of resistant organisms.
- Availability of data on prevalence, morbidity, mortality and associated costs related to resistant organisms in the province.

Next Steps

- Complete the analysis of data from the B.C. Antibiotic Resistance Surveillance Network pilot project.
  Lead agency: B.C. Centre for Disease Control.
- Develop a proposal for a comprehensive, coordinated surveillance capacity, using data from the Surveillance Network pilot project as a guide. *Lead agency: B.C. Centre for Disease Control, in collaboration with the B.C. chapter of the Canadian Association of Medical Microbiologists.*

Case Management

Priorities for Action

- Continue to develop, update, and implement effective infection control guidelines to control the spread of resistant organisms.
- Develop and implement practical guidelines for screening of patients with resistant organisms.
- Eliminate barriers that impede movement of patients across the health care spectrum by providing education to health care providers.

Evaluation

Indicators of success in case management include:

- Adoption of standard infection control and screening guidelines throughout the province.
- Decrease in waiting times for transfer of affected patients from acute care facilities.
- Reduced rates of resistant infections in institutional settings.

Next Step

- Continue to develop and implement province-wide standards for screening and infection control within and outside of health facilities, and for placement of patients who are carriers of resistant organisms. *Lead agency: B.C. Centre for Disease Control, in collaboration with local health authorities.*

Education and Awareness

Priorities for Action

- Continue to raise public awareness about the risks of antimicrobial resistance and the importance of appropriate use.
- Continue to raise awareness among prescribers about the risks of resistance and the importance of appropriate prescribing.
- Meet specific education and training requirements through collaboration with professional organizations and by providing input to curricula for various disciplines.

Evaluation

Indicators for progress related to education include:

- Reductions in antibiotic usage.
- Increased levels of public and professional awareness.
- Increased content in educational curricula for various professionals.

Next Step

- Develop a province-wide information campaign directed towards health professionals and the public.
  Lead agency: B.C. Ministry of Health, in collaboration with groups and individuals involved in developing educational materials for health care workers and the public.

Animal and Agricultural Use

Priorities for Action

- Develop a clear mandate and chain of responsibilities for action on animal and agricultural issues. Provide personnel, diagnostic laboratory facilities, and other supports.
- Promote prudent use of antimicrobials in agricultural settings.
- Implement monitoring mechanisms for antimicrobial use in animals and for surveying the prevalence and susceptibility of resistant organisms.
- Support research on risks to human health related to use of antimicrobials in animals, on alternatives to use of antimicrobials for growth promotion, and on issues related to companion animals.

Evaluation

Indicators for progress related to animal and agricultural issues include:

- Expanded capacity of provincial infrastructures linking animal issues and human health.
- Availability of data on the use of antimicrobials in food production and veterinary medicine.
- Reduced reliance on antimicrobials in food animals.

Next Steps

- Encourage the provincial government to pass the *Food Safety Act* at the earliest opportunity.
  Lead agency: B.C. Ministry of Health.
- Adopt the recommendations in the Centre of Coastal Health's research report on the current status of knowledge of antimicrobial use in animals, patterns of antimicrobial sensitivity in selected zoonotic pathogens, and potential transmission of resistance to humans.
  Lead agencies: B.C. Ministry of Health and B.C. Ministry of Agriculture, Food and Fisheries.

Background

Before the discovery of penicillin just over 70 years ago, infectious disease was the most common cause of death among all age groups. For a few decades, an apparently inexhaustible supply of relatively inexpensive drugs seemed to have conquered all but the most deadly infections. In recent years, however, many antibiotics have lost their effectiveness against powerful new strains of super bugs. Increasingly, experts warn of the imminent return of a post-antibiotic era in which infection is once again the major threat to public health.

What is antimicrobial resistance?

Bacteria, viruses, parasites, fungi, and other micro-organisms can develop the ability to resist drugs designed to kill or inhibit their growth.

"Antimicrobial" is a general term that refers to drugs, disinfectants, or other substances that can kill or inhibit the growth of harmful micro-organisms. Antibiotics (used to treat bacterial infections), antifungals, antivirals, and antiprotozoals are examples of antimicrobials.

Antimicrobial resistance (also called "drug resistance") occurs when bacteria or other organisms are exposed to antimicrobial drugs and, through a process of natural selection, develop genetic mutations that make the drugs ineffective. When organisms carry resistance factors, the resistant strains may transmit their resistance mechanisms to similar or entirely different organisms. This transmission can occur even if the host animal or human has no signs of illness, and even if the initial strain itself does not persist in the host. Once resistance occurs or is spread, the change may be irreversible, even if the organism is no longer exposed to antimicrobial drugs.

While antimicrobial resistance occurs naturally, its emergence and spread has been accelerated by over-use and inappropriate use of drugs. Growth in world trade and international travel has further contributed to the rapid spread of resistant organisms. In many developing countries, antibiotics are sold without prescription; inappropriate use and counterfeit drugs are common. In developed countries, antibiotics are often incorrectly prescribed for viral infections such as colds and influenza.

Over-use of antimicrobials in food production also leads to drug resistance. Currently, half of all antibiotics produced in North America are used in animals, not only to treat sick animals, but also to promote growth in livestock and poultry. Many of these antibiotics are the same as, or similar to, those used for human health. There is evidence that resistance can be transmitted to humans through the consumption of meat from animals or other foods that have acquired resistant organisms. Antibiotics are also used in agriculture, as in the spraying of fruit trees to control bacteria.

Despite common perception, only a few new classes of antibiotics have been developed in recent years. There have been some new classes of agents developed, but these are not in widespread use. Most newly-introduced formulations of antibiotics are derivatives of older products, and pharmaceutical companies have as yet been unable to create replacements for those drugs that are rapidly losing effectiveness.

Terms and Definitions

Infectious diseases: Diseases caused by bacteria, virsuses, or other agents that can produce infections. There are many infectious diseases. Pneumonia, diarrhoeal diseases, HIV/AIDS, tuberculosis, and gonorrhoea are some examples. Anti-infective drugs (antibiotics and antimicrobials) are critically important in treating infectious diseases.

Antibiotic: A drug designed to kill bacteria. Antibiotics are used to treat bacterial infections ranging from life-threatening meningitis to common problems like acne and strep throat.

Antimicrobial: A broader term than antibiotics. Includes drugs or disinfectants designed to kill or inhibit growth other types of organisms - viruses, parasites, and funguses, etc., as well as bacteria.

Antimicrobial resistance: Ability of microbes to resist drugs or other substances designed to kill them. Also called "drug resistance". Many common bacteria and other organisms have developed resistant strains, making them difficult to treat.

Methicillin-resistant *Staphylococcus aureus* (MSRA) and vancomycin-resistant enterococci (VRE): Strains of staphylococcus ("staph") and enterococci (bacteria found in the stomach and bowels) that have become resistant to antibiotics commonly used to treat them. MSRA and VRE have become common in many hospital settings.

What diseases are affected by drug resistance?

Many diseases that used to be easily curable with antibiotics are now resurfacing in the form of difficult-to-treat, drug-resistant strains. The table below gives some examples of diseases affected by drug resistance, according to a recent report by the World Health Organization (World Health Organization, 2000).

Examples of Diseases Affected by Drug Resistance

Disease	Problem
Pneumonia	*Streptococcus pneumoniae*, a common cause of pneumonia and other serious bacterial infections*, has become resistant to penicillin.
Diarrhoeal diseases	*Shigella dysenteriae* and *Salmonella typhi* are resistant to multiple drugs. Drugs used to treat cholera and typhoid are losing effectiveness.
HIV/AIDS	Some patients are showing resistance to AZT and other antiviral drugs.
Tuberculosis	A growing number of cases are resistant to at least one drug. Multiple-drug resistance occurs in 1 to 2 per cent of cases globally.
Gonorrhea	Penicillin resistance is entrenched world-wide. New, more expensive drugs are also showing a failure rate.
Hospital-acquired infections	Staphylococcus ("staph") and other infections acquired in hospitals are becoming resistant to each successive drug developed to treat them. Hospital-acquired infections such as MSRA and VRE have spread outside the hospital to the general population.
Viral hepatitis	Hepatitis B and C viruses are showing high levels of resistance to treatment.
Malaria	Resistance to chloroquine is widespread. Resistance to newer, more expensive drugs is growing.

* *Streptococcus pneumoniae* (pneumococcus) can cause pneumonia, meningitis, septicemia (infection of the blood), and bacterial ear infections.

Streptococcus pneumoniae, an organism that can cause pneumonia, meningitis, and ear infections, has become increasingly resistant to penicillin and other antibiotics.

Methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE) have become common in many hospital settings and are responsible for illness and death in an increasing number of vulnerable patients, especially those with immune system deficiencies and the elderly. While rates of resistance have historically been lower in Canada than in the United States, resistance in Canada has increased sharply in recent years. A five-year study involving 35 Canadian hospitals showed a rise in the incidence of MRSA from 0.5 per cent in 1995 to over 6 per cent of isolates in 1999 (Health Canada, 2000). Resistant organisms are responsible for illness and death not only among vulnerable or hospitalized populations, but also in the community.

So far, drug-resistant tuberculosis and gonorrhea have not become a major problem in British Columbia. However, drug resistance does occur, and patterns are being closely monitored. In 1998, about 4 per cent of gonorrhea cases showed resistance to several antibiotics. About 10 per cent of tuberculosis cases are resistant to at least one drug; multiple-drug resistance is less common - about one per cent of cases.

Who is at risk?

Anyone can acquire a drug-resistant infection. Drug-resistant infections may be acquired in health care institutions (e.g., staphylococcal infections in intensive care units), in the community (e.g., pneumococcal pneumonia acquired from a classmate or a work colleague), or through the food supply (e.g., salmonella acquired from meat or eggs), either locally or while travelling. Resistant microbes are increasingly appearing in new settings. MRSA and VRE, which used to be only a problem in hospitals, are now occurring in the community.

Certain people are at increased risk for drug-resistance infections because of their age, medical condition, or living conditions. Vulnerable groups include young children (particularly children in group care settings), the elderly, patients in hospitals, and residents of long-term care facilities.

What are the costs?

Antimicrobial resistance can have devastating personal and economic consequences. Patients whose infections are resistant to standard drug treatments require longer hospital stays, more expensive drugs, higher personnel costs, more specialized laboratory services, and more stringent infection control practices. Treating a patient infected with MRSA, for example, costs an additional $1,400 per infection. MRSA adds an estimated $24 to $33 million a year to health care costs in Canada, according to Health Canada. Treatment of one patient with multi-drug resistant tuberculosis can cost $500,000 - 25 times more than the cost of treating a non-resistant form of the disease.

Inappropriate prescribing of antibiotics is costly, too. The number of prescriptions per capita for antibiotics has been declining - from nearly one prescription for each B.C. resident in 1996 to 0.8 prescriptions in 1999. This is an encouraging trend, because it is known that antibiotics have been over-used in the past. However, some people are still receiving antibiotics they do not necessarily need. Despite evidence that many prescribed antibiotics are unnecessary, about 3 million outpatient prescriptions for antibiotics were written in the province last year. This amounts to an estimated total cost of nearly $80 million. Appropriate prescribing would save some of these costs, while helping to reduce the problem of drug resistance.

Calls to Action

International Action

The World Health Organization (WHO) is one of a variety of government, academic, and professional groups urging immediate action on the issue of antimicrobial resistance. In June 2000, the WHO released a report warning that drug resistance threatens to reverse medical progress world-wide, eroding progress achieved in recent decades. The report, titled *Overcoming Antimicrobial Resistance,* notes that almost all major infectious diseases – including tuberculosis, malaria, HIV/AIDS, and hepatitis B – are becoming resistant to existing medicines. The WHO cautions that

> *Before long, we may have forever missed our opportunity to control and eventually eliminate the most dangerous infectious diseases. Indeed, if we fail to make rapid progress during this decade, it may become very difficult and expensive – if not impossible – to do so later* (World Health Organization, 2000).

Recommendations in the WHO report focus on prevention of infectious disease among human and animal populations, preserving the efficacy of available drugs, and promoting the discovery of new antimicrobial agents. In the same month, WHO released a separate report and recommendations on the use of antibiotics in animals and agriculture, with strong recommendations for curtailing inappropriate use in food production (World Health Organization, Department of Communicable Disease Surveillance and Response, 2000). A further WHO report, *Global Strategy for Containment of Antimicrobial Resistance,* is currently under development.

The Centers for Disease Control and Prevention in the United States recently issued the first part of a draft *Public Health Action Plan to Combat Antimicrobial Resistance* (Task Force on Antimicrobial Resistance, 2000). The June 2000 document calls for comprehensive recommendations in four focus areas: surveillance, prevention and control, research, and product development.

The Centers for Disease Control plan is designed to provide a blueprint for specific, coordinated federal actions to address the emerging threat of antimicrobial resistance in the United States. A second part of the plan, to be developed subsequently, will offer recommendations for international action, recognizing that antimicrobial resistance transcends national borders and requires a global approach to prevention and control.

Canadian Action

In May 1997, Health Canada sponsored a Consensus Conference on Antimicrobial Resistance, involving eleven working groups with representation from the health professions, universities, government agencies, and industry. The conference generated an *Integrated Action Plan for Canadians on Controlling Antimicrobial Resistance* (Health Canada, 1997).

The *Action Plan* is comprised of 27 key recommendations. Heading the list are formation of a national steering committee, establishment of a national surveillance system, and reductions in antibiotic use. Parts of the *Action Plan* have been implemented, but recent reorganization within Health Canada has curtailed antimicrobial resistance activities formerly managed through the Health Protection Branch, Laboratory Centre for Disease Control. Because the federal government has articulated a partnership model for action on this issue, related health protection activities will likely continue to be primarily a provincial responsibility.

Canadian Committee on Antimicrobial Resistance (CCAR)

In 1999, Health Canada provided a three-year financial contribution of $750,000 to support the establishment of the Canadian Committee on Antimicrobial Resistance (CCAR) as a non-government agency with a mandate to facilitate the implementation of the national *Action Plan*.

Members of CCAR are both public sector and non-profit private sector organizations. These organizations include the Canadian Association of Medical Microbiologists, Canadian Infectious Disease Society, the Canadian Medical Association, the Canadian Paediatric Society, the Canadian Pharmacists Association, the Canadian Public Health Association, the Canadian Veterinary Medical Association, the College of Family Physicians of Canada, a pharmaceutical industry-sponsored consortium, and several federal government agencies.

CCAR has adopted a coordinating role and will not act as a funding agency; it plans to assist organizations to identify and access suitable funding mechanisms for program support.

CCAR has developed a draft proposal for a national surveillance network. While some expansion of current systems is anticipated, the network would be structured primarily to coordinate and disseminate information from existing surveillance activities with collaboration of provincial agencies. CCAR has proposed an annual budget requirement of approximately $3 million to implement this network. More information about CCAR is available from their web site, http://www.ccar-ccra.org.

British Columbia Action

As a follow-up to the national consensus conference in 1997, the Provincial Health Officer convened a B.C. Antimicrobial Resistance Action Plan Steering Committee. Committee members, who have volunteered their time, represent a range of interests including microbiology, infectious diseases, medicine, veterinary medicine, and the pharmaceutical industry. Meeting approximately five times a year and chaired by the Deputy Provincial Health Officer, the group has worked to determine the scope of the problem in the province and to define priorities for action. The following terms of reference were developed by the committee.

Purpose:

1. To provide an inter-sectoral (inter-disciplinary, multi-interest stakeholder) group.
2. To share information about activities directed towards the goals of the committee.
3. To recommend public policy or other actions to address issues related to the goals.
4. To provide regular advice and recommendations to the Minister of Health, the Minister of Agriculture, and other Ministers as appropriate.

Goals:

1. To enhance health by optimizing appropriate microbial use.
2. To limit the emergence and spread of antimicrobial resistant organisms and adverse events from antimicrobial utilization.

Specific objectives of the group include reducing inappropriate antimicrobial use and improving coordination of activities between human and veterinary medicine, particularly as it relates to surveillance of antimicrobial use and monitoring for antimicrobial resistance in common human and veterinary pathogens.

Committee membership has been comprised of the following individuals or delegates (see Appendix I for a list of committee members):

Deputy Provincial Health Officer (Chair)
Division of Medical Microbiology, Department of Pathology, University of British Columbia
Department of Pediatrics, University of British Columbia
Pharmaceutical industry
Epidemiology Services, B.C. Centre for Disease Control
Division of Infectious Diseases, University of British Columbia
Chair, Infectious Disease Committee, B.C. Medical Association
B.C. Ministry of Agriculture, Foods and Fisheries
Pharmacare, B.C. Ministry of Health
Hospital pharmacy representative

Strategic Planning Process

In June 2000, the Steering Committee, with funding provided through the Ministry of Health, held a one-day planning workshop with the specific objective of developing the framework for a provincial action plan on antimicrobial resistance. To broaden representation at the workshop, several individuals with expertise in specific areas of interest were invited to participate in addition to the members of the Steering Committee. Participants included specialists in medicine, microbiology, epidemiology, nursing, agriculture, veterinary science, communications, and education. Several representatives of government agencies with responsibilities for this issue also attended. Thus, the planning workshop incorporated input for a broadly-based and interdisciplinary group of experts and stakeholders. A list of participants is provided in Appendix II.

At the workshop, participants received status reports on four topics:

- surveillance;
- case management;
- public and professional education and awareness; and,
- animal and agricultural use of antimicrobials.

Following these presentations, participants formed small working groups on these topics and engaged in a structured process to define and rank priorities, discuss the consequences of action versus inaction, identify stakeholders, outline key actions, describe available and needed resources, and indicate how progress would be measured and evaluated. At the conclusion of the workshop, deliberations on each topic were presented for comment to the entire group of participants.

Benefits and Risks

There was marked similarity of opinion among the planning groups on the benefits of action to control antimicrobial resistance. These were identified as improved health status, reduced morbidity and mortality, more efficient use of facilities and resources, and cost savings related to personnel, infection control measures, and treatment of resistant infections. The workshop participants also agreed on expected consequences of inaction, including adverse health impacts, longer hospital stays, increased pressures on availability of acute care beds, higher treatment costs, and threats to the safety of the food supply.

Key Stakeholders

The action planning groups generated lists of stakeholders whose input and collaboration were considered essential to ensure effective provincial action on this issue. Key stakeholders were identified as:

- The B.C. Ministry of Health
- The B.C. Ministry of Agriculture, Fisheries and Food
- Health care institutions (long-term care and acute care)
- Diagnostic and public health laboratories
- Medical Services Plan
- Pharmanet and hospital pharmacy information systems
- B.C. Centre for Disease Control
- Medical health officers
- Medical microbiologists
- Infectious disease specialists
- Other stakeholders, including practising physicians, veterinarians, pharmacists, nurses, child care providers, the media, professional and educational organizations, and the pharmaceutical industry.

Available and Needed Resources

The planning groups emphasized that significant personnel and financial resources are already committed to dealing with the problem of antimicrobial resistance in B.C. Implementation of the recommendations in this Plan may be accomplished, at least in part, by realigning existing capacity within the provincial government and partner organizations.

The province currently has mechanisms in place to initiate activity in many priority areas. Some baseline activities are underway in surveillance and education, and many care facilities have already demonstrated their ability to reduce infection rates through the implementation of appropriate infection control and case management guidelines. High levels of interest and expertise, in addition to a collaborative environment of individuals with responsibilities related to this issue, were also identified as resources available in the province.

The planning groups identified the following needs:

- more coordination and collaborative efforts across jurisdictions and disciplines;
- a clear mandate from the ministries of health and agriculture that antimicrobial resistance is a priority concern; and,
- dedicated funding to free up staff time for coordination and to support new functions such as the expansion of surveillance systems.

The following pages summarize information on the current status of activities in British Columbia, along with specific recommendations made by the planning groups in each of the four focus areas.

Surveillance

Surveillance – the ongoing, systematic collection, analysis, interpretation of data, and dissemination of information – is essential to the prevention and control of antimicrobial resistance. Surveillance provides early warning of emerging problems, along with information to assist in developing control measures and monitoring their impact.

While some monitoring systems are in place in British Columbia, the current level of surveillance is not sufficient to track the emergence of all resistant organisms, either in institutional settings or in the community.

For gonorrhoea and tuberculosis, ongoing monitoring systems are in place to track the proportion of cases that are resistant to one or more drugs. Statistics on drug resistance are reported in annual reports issued by the STD/AIDS Control and Tuberulosis Divisions of the B.C. Centre for Disease Control. For HIV, resistance to AZT and other drug therapies is monitored by the BC Centre for Excellence in HIV/AIDS.

For infections in that occur in health care facilities, some B.C. data are collected through ongoing national surveillance mechanisms. The Canadian Hospital Epidemiology Committee collects information from 25 sentinel Canadian institutions on MRSA and VRE for analysis in federal laboratories. The IMPACT network collects information from 12 paediatric hospitals, including B.C.'s Children's Hospital. The Surveillance Network, a private for-profit company, collects information on resistant organisms from 15 Canadian sites, including 5 in British Columbia.

The B.C. government funded a one-year Surveillance Network pilot project in 1999-2000 to collect data on MRSA, VRE and invasive pneumococci. Data are currently being analyzed. This project will help to establish a baseline for monitoring MRSA, VRE, and invasive pneumococci, but funding for this surveillance activity ended in October 2000.

Resources are needed to support continuation of present monitoring, to expand the scope of surveillance to cover other target organisms, and to develop links with veterinary and agri-food surveillance systems. In addition, mechanisms must be put in place to survey not only the prevalence of resistant organisms, but also the significance of antimicrobial resistance in terms of health-related impact and cost.

Surveillance Systems for Antimicrobial Resistance in B.C.

System/ Organization	Organism	Status
B.C. Antibiotic Resistance Surveillance Network	MRSA VRE Invasive pneumococci	One-year pilot project ended October 2000. Data analysis in progress.
B.C. Centre for Disease Control	Gonorrhea	Ongoing monitoring of cases resistant to penicillin and other drugs.
B.C. Centre for Disease Control	Tuberculosis	Ongoing monitoring of cases resistant to TB medications.
BC Centre for Excellence on HIV/AIDS	HIV	Ongoing monitoring of primary and secondary resistance for patients receiving AZT and other drug therapies.
B.C. Centre for Disease Control	*Neisseria meningitidis*	All reported isolates causing invasive disease are monitored for resistance to a panel of antibiotics.

Priorities for Action

- Develop a coordinated provincial plan for surveillance of antimicrobial use and antimicrobial resistance, in human and non-human settings.
- Identify and coordinate key source data on antimicrobial resistance and associated morbidity and mortality.
- Define and apply standardized definitions and methods for surveillance data.
- Develop integrated computer systems and database networks.
- Develop platforms for dissemination of information to enable regular publication of surveillance reports.

Evaluation

Indicators for improvements in surveillance include:

- Standardization of practices for screening and lab detection of resistant organisms.
- Availability of data on prevalence, morbidity, mortality, and associated costs related to resistant organisms in the province.

Next Steps

- Complete the analysis of data from the B.C. Surveillance Network pilot project.
  Lead agency: B.C. Centre for Disease Control.
- Develop a proposal for a comprehensive, coordinated surveillance capacity, using data from the Surveillance Network pilot project as a guide.
  Lead agency: B.C. Centre for Disease Control, in collaboration with the B.C. chapter of the Canadian Association of Medical Microbiologists.

Case Management

When drug-resistant infections occur, providing appropriate care helps affected individuals recover and reduces their risk of spreading the infection to others. Managing cases in hospitals and other facilities has become a major health care concern, because of the large and growing number of drug-resistant infections in those settings. Furthermore, infections in health care institutions can spread into the community.

Resistant organisms have intensified and complicated requirements for infection control in hospitals and long-term care facilities. They have also demonstrated a need to coordinate infection control practices between the acute care sector, long-term care, and home care of patients. Health care workers express concern both about the welfare of patients with resistant organisms and about potential risks to their own health.

An advisory group coordinated through the B.C. Centre for Disease Control has developed *Guidelines for control of methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE)*. The guidelines are designed to advise professionals in managing patients carrying or infected with these resistant organisms, both within and outside institutions and as patients move from one health care setting to another in the province. While they are not regulatory, the guidelines can assist in standardizing infection control practices, education, and communication.

Continued efforts are required to keep existing infection control guidelines up to date, to facilitate implementation of guidelines throughout the province, and to evaluate the effectiveness of these actions. Guidelines have also been developed for screening of patients on admission to facilities, but further work is needed to encourage consistent compliance with these recommendations. In addition, many care settings lack sufficient space and facilities for appropriate management of all identified carriers of resistant organisms.

Resistant infections complicate transfer of patients from acute to long-term care facilities, with an adverse impact on the overall functioning of the health care system. A recent three-year study at Vancouver General Hospital showed that 39 patients identified with MRSA or VRE waited an average of 61 days longer than a control group of non-infected patients for placement in long-term care facilities, at an additional cost of $1.7 million.

Nearly 60 per cent of long-term care facilities in Vancouver currently have or have had known carriers of MRSA, and 13 per cent have residents who are known carriers of VRE. While the Vancouver/Richmond Health Board requires long-term care facilities to accept patients with MRSA or VRE, such policies are not standard in other regions of B.C. Significant cost savings could be realized by facilitating earlier transfer of these patients from acute care facilities.

Priorities for Action

- Continue to develop, update, and implement effective infection control guidelines to control the spread of resistant organisms.
- Develop and implement practical guidelines for screening of patients with resistant organisms.
- Eliminate barriers that impede movement of patients across the health care spectrum by providing education to all involved health care providers.

Evaluation

Indicators of success in case management include:

- Adoption of standard infection control and screening guidelines throughout the province.
- Decrease in waiting times for transfer of affected patients from acute care facilities.
- Reduced rates of resistant infections in institutional settings.

Next Step

- Continue to develop and implement province-wide standards for screening and control of infections within and outside of health care facilities, and for placement of patients who are carriers of resistant organisms.
  Lead agency: B.C. Centre for Disease Control, in collaboration with local health authorities.

Education and Awareness

Getting the right treatment helps people with infections get better more quickly, prolongs the useful life of antimicrobial drugs, and ensures we are getting the best value for our health care dollars. On the other hand, overuse and inappropriate use of antimicrobials can hasten the development of drug-resistant organisms. To ensure that these messages reach health professionals and the public, education and awareness strategies are essential components of an overall plan to prevent and control antimicrobial resistance.

National polls have revealed a lack of knowledge among consumers regarding the difference between viral and bacterial infection, and about the importance of completing a course of antibiotics when prescribed (National Information Program on Antibiotics, 1997). Other studies have shown a need to raise awareness among physicians and other prescribers such as dentists and veterinarians about judicious prescribing and the risk of antimicrobial over-use. Additional educational needs relate to specific skills and training for nurses and other care providers. To be fully effective, education and awareness strategies for each of these groups require coordination and sufficient resources.

Various educational efforts have been introduced nationally and in British Columbia. The National Information Program on Antibiotics (NIPA), a consortium of non-profit organizations with funding from Pfizer Canada, sponsored a national information campaign carrying basic messages about appropriate use of antibiotics. Abbott Laboratories has been an active member of the B.C. Antimicrobial Resistance Action Plan Steering Committee, and also has been active in providing education and disseminating information to physicians, pharmacists, and the public in British Columbia. Some controversy exists, and has been expressed in the Steering Committee, about a potential conflict of interest related to pharmaceutical company sponsorship of efforts on this topic.

Two pilot projects have been conducted in the province without pharmaceutical company support. The *UBC Antibiotic Resistance Education Project* has developed physician and patient resources to promote judicious prescribing for the treatment of upper respiratory infections in preschool-aged children. These materials draw on studies which have explored behavioural barriers to changing prescribing practices, including physicians' perceptions of patient expectations for antibiotics and patients' misunderstanding about the effectiveness of antibiotics against viral

infections such as colds and flu. The resource package developed by the project was distributed by the B.C. Medical Services Plan to the province's 5,000 primary care physicians in February 1999. Evaluation showed positive response by recipients and a decrease in paediatric antibiotic prescriptions in the year following the intervention (Paluck, 1999).

The *Better Prescribing Project* is a Health Canada-funded randomized controlled trial using practice-based small group learning to support good prescribing practices among community physicians. A case-based educational module reviewed evidence for and against the routine use of antibiotics in childhood ear infections. The module was designed to stimulate discussion around managing parents' expectations of antibiotic treatment and included parent education materials. The intervention also tested the feasibility and acceptability of using an on-line prescription database (PharmaNet) to provide timely feedback to physicians on their prescribing patterns for the four health conditions under study.

Each of these projects has identified mechanisms with potential for raising awareness and improving prescribing practices. However, further support is required to implement the findings of these projects.

Priorities for Action

- Continue to raise public awareness about the risks of antimicrobial resistance and the importance of appropriate use.
- Continue to raise awareness among prescribers about the risks of resistance and the importance of appropriate prescribing.
- Meet specific education and training requirements through collaboration with professional organizations and by providing input to curricula for various disciplines.

Evaluation

Indicators for progress related to education include:

- Reductions in antibiotic usage.
- Increased levels of public and professional awareness.
- Increased content in educational curricula for various professionals.

Next Step

- Develop a province-wide information campaign directed towards health professionals and the public.
  Lead agency: B.C. Ministry of Health, in collaboration with groups and individuals involved in developing educational materials for health care workers and the public.

Animal and Agricultural Use

Development of effective strategies related to the use of antimicrobials in animals and agriculture is complicated by a shortage of baseline information in B.C. Considerable work will be required to determine the burden of risks versus the benefits of antimicrobials as applied to food production and veterinary medicine. Limited funding of the provincial veterinary laboratory limits the amount of data available in this province on the prevalence of resistant organisms in animal populations.

Currently, there is a lack of information about the types of antimicrobials used in individual animals or herds and about the indications for use. A higher level of information is available from salmon farming. Conversely, virtually no information is collected on the use of antibiotics in companion animals (pets). In addition, there is presently no coordination of efforts to harmonize systems between human and veterinary laboratories.

The Centre for Coastal Health has recently published a report that is a summary of the current status of knowledge of antimicrobial use in animals, patterns of antimicrobial sensitivity in selected zoonotic pathogens, and potential transmission of resistance to humans (Stephen, Sifton, Bowie, 2000). A complete description of all recommendations contained in the *WHO Global Principles for the Containment of Antimicrobial Resistance in Animals Intended for Food* is available (World Health Organization, Communicable Disease Surveillance and Response, 2000).

On behalf of the Action Plan Steering Committee, Dr. William Bowie of the University of British Columbia Faculty of Medicine made a presentation to the B.C. Select Standing Committee on Agriculture and Fisheries in December, 1999. Dr. Bowie's recommendations included:

- consistent and collaborative monitoring of resistant organisms in animals and humans;
- education to promote judicious use of antimicrobials in the agri-food industry;
- research on alternatives to the use of antimicrobials in food production; and,
- formal or informal restrictions on antimicrobial use in animals and agriculture.

Dr. Bowie also stressed the importance of maintaining the economic viability of the agri-food industry.

At this time, British Columbia does not have legislation that deals directly with the health risks related to antimicrobial use in animals. Last year, a *Food Safety Act* was introduced to the Legislature, but the *Act* failed to proceed past first reading. The workshop planning group suggested that this *Act* would provide the legislative support needed to integrate the responsibilities of the Ministry of Health and the Ministry of Agriculture, Food, and Fisheries on this issue. The *Food Safety Act* would enable the generation of regulations to provide comprehensive information on the use of antibiotics in animal feeds, rates of antibiotic resistance in bacteria from animals, and on rates of animal infection with diseases of concern to human health.

Priorities for Action

- Develop a clear mandate and chain of responsibilities for action on animal and agricultural issues. Provide personnel, diagnostic laboratory facilities, and other supports.
- Promote prudent use of antimicrobials in agricultural settings.
- Implement monitoring mechanisms for antimicrobial use in animals and for surveying the prevalence and susceptibility of resistant organisms.
- Support research on risks to human health related to use of antimicrobials in animals, on alternatives to use of antimicrobials for growth promotion, and on issues related to companion animals.

Evaluation

Indicators for progress related to animal and agricultural issues include:

- Expanded capacity of provincial infrastructures linking animal issues and human health.
- Availability of data on use of antimicrobials in food production and veterinary medicine.
- Reduced reliance on antimicrobials in food animals.

Next Steps

- Encourage the provincial government to pass the *Food Safety Act* at the earliest opportunity.
  Lead agency: B.C. Ministry of Health.
- Adopt the recommendations in the Centre of Coastal Health's research report on the current status of knowledge of antimicrobial use in animals, patterns of antimicrobial sensitivity in selected zoonotic pathogens, and potential transmission of resistance to humans.
  Lead agencies: B.C. Ministry of Health and B.C. Ministry of Agriculture, Food and Fisheries.

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Appendix I

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